

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.
IN COOPERATION WITH THE STATE OF ALABAMA, CHARLES HENDERSON,
GOVERNOR; J. A. WADE, COMMISSIONER OF AGRICULTURE AND
INDUSTRIES; EUGENE A. SMITH, STATE GEOLOGIST.

SOIL SURVEY OF MORGAN COUNTY, ALABAMA.

BY

AUSTIN L. PATRICK, IN CHARGE, HOWARD C. SMITH,
R. T. AVON BURKE, A. M. O'NEAL, JR., AND
GROVE B. JONES.

W. EDWARD HEARN, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1918.]



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., May 4, 1920.

SIR: I have the honor to transmit herewith the manuscript report and map covering the soil survey of Morgan County, Alabama, and to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils, 1918, as authorized by law. This work was done in cooperation with the State of Alabama.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. E. T. MEREDITH,
Secretary of Agriculture.

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MAP.

Soil map, Morgan County sheet, Alabama.

SOIL SURVEY OF MORGAN COUNTY, ALABAMA.

By AUSTIN L. PATRICK, In Charge, HOWARD C. SMITH, R. T. AVON BURKE, A. M. O'NEAL, Jr., and GROVE B. JONES.—Area Inspected by W. EDWARD HEARN.

DESCRIPTION OF THE AREA.

Morgan County is situated in the northern part of Alabama, about 60 miles north of Birmingham, the Tennessee River forming the northern boundary. The county has a maximum length, from east to west, of $31\frac{1}{2}$ miles, and a maximum width, from north to south, of $25\frac{1}{2}$ miles. It comprises an area of 587 square miles, or 375,680 acres.

Physiographically, Morgan County consists of a series of generally east-west upland and lowland belts. The upland belts consist of smooth-topped plateau remnants and the lowlands of belts of undulating country produced by erosion. The most southerly belt skirts the southern part of the county, extending over the boundary but a few miles, from the southwest corner eastward about two-fifths of the distance to the southeast corner. East of that its northern boundary runs northeastward to the Tennessee River a few miles west of the northeast corner. It occupies all the southeastern part of the county. Immediately north of this lies a lowland belt known as the Moulton Valley in the western part, the Flint Valley in its central part, and the Cotaco Valley in its northeastern part. In the last and extending southwestward to about the middle of the county it is narrow, ranging in width from 2 or 3 miles to not more than 5 or 6 miles. West of this it spreads out to a maximum width of about 10 miles. It consists of an undulating to rolling lowland ranging in elevation from 575 to 700 feet above sea level, and 250 to 500 feet below the top of the upland belt to the south.

North of the Moulton-Cotaco lowland lies the Little Mountain belt, ranging from 3 to 10 miles in width, and reaching an elevation of 1,000 to 1,200 feet above sea level, about the same as that of Sand Mountain south of the Moulton-Cotaco Valley. Like Sand Mountain, it is a remnant of a plateau, smooth on top and ragged

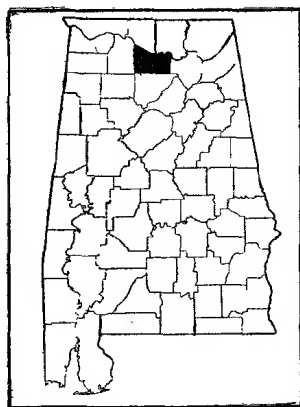


FIG. 1.—Sketch map showing location of the Morgan County area, Alabama.

along the edges, owing to the shredding of the edges by the headward cutting of streams working backward from the lowland belts on each side. The descent from the top of the mountain to the lowlands on both sides is steep.

The Tennessee Valley as here defined and as the term is here used consists of a lowland belt occupying the northeastern corner of the county lying between the northern foot of Little Mountain and the Tennessee River. It consists of an undulating plain with about the same relief as the Moulton Valley. The location and relative areas of these belts are shown on the sketch map, figure 2.

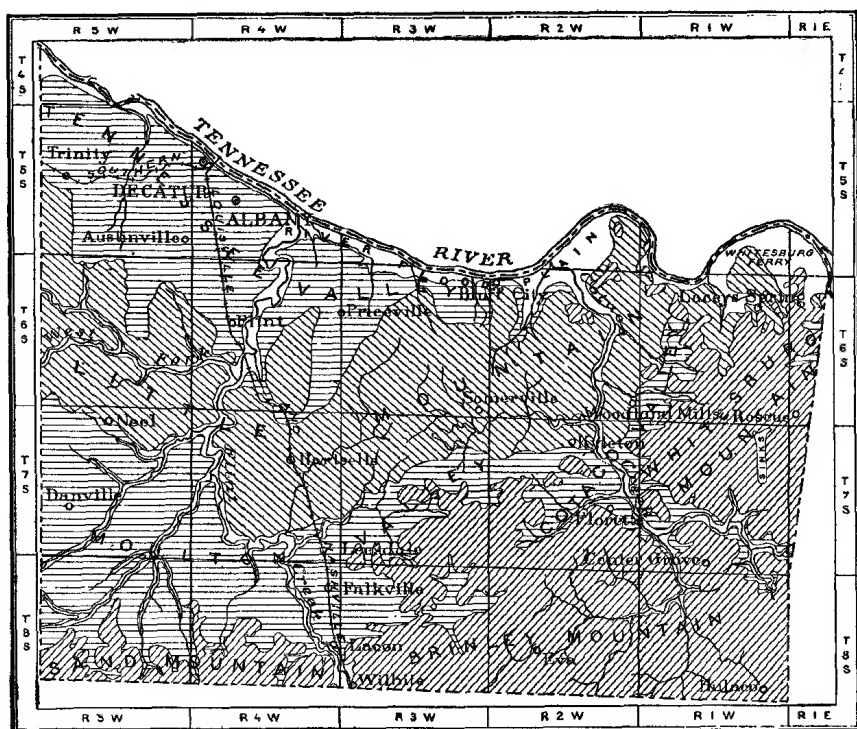


FIG. 2.—Sketch map showing topographic divisions.

The bottom-land section consists of alluvial areas bordering the Tennessee River and its tributaries. The only important second bottom or terrace occurs in the northeastern corner of the county, near Laceys Spring and Whitesburg Ferry. The river bottoms are comparatively narrow, the widest occurring just west of Cotaco Landing. The creek bottoms are wider, in proportion to the size of the stream, than those of the Tennessee.

Morgan County lies wholly within the Tennessee drainage system. Flint Creek and its tributaries drain most of the western half of the county, while Cotaco Creek drains by far the greater part of the

eastern half. The county as a whole is fairly well drained. The largest poorly drained areas occur in the Moulton and Tennessee Valleys, but there are some small depressions on Little Mountain, Sand Mountain, and Brinley Mountain in which water stands all or a large part of the year. Water for domestic use is quite readily available in all parts of the county except on the mountain tops, where it is not always available at practicable depths, owing to the porous nature of the underlying material.

In many places the drainage reaches the valleys through underground channels, coming to the surface through caves and springs. The Newsome Sinks, near the eastern border of the county, are the largest of the subterranean drainage courses. There are many large caves, some of which have been explored for over one-half mile.

In a few places along the north slopes of the mountains there are small waterfalls. Nearly all the streams flow rather swiftly, especially in the higher sections, and here at least waterpower could be developed.

Morgan County was included in the Cherokee Indian cession made in 1816, and was established in 1818. The county was settled largely by immigrants from Virginia and the Carolinas. Many settlers also came from Tennessee and Kentucky. The white population to-day consists largely of descendants of the original settlers.

According to the census, the population of Morgan County was 16,428 in 1880, 24,089 in 1890, 33,781 in 1910, and 40,196 in 1920. In 1920 the census classed 12,404 of the population as urban, and 27,792 as rural, the latter forming 69.4 per cent of the total. The rural population averages 47.3 persons to the square mile. The urban population as classed by the census is confined to Albany and Decatur, no other town having a population over 2,500. The rural population is fairly well distributed. Settlement is densest within several miles of the railroads and in the valleys. The mountain land, however, is being cleared rapidly.

Decatur, the county seat, had a population of 4,752 in 1920, and Albany (New Decatur) a population of 7,652. Hartsells, the only other important town, is situated about 12 miles south of Decatur on the Louisville & Nashville Railroad. It had a population of 2,009 in 1920. These three towns are important trading and shipping centers. The Louisville Nashville Railroad shops are located in Albany, and there are cotton gins, spinning mills, and machine shops in all three towns. Flint, Trinity, Lacon, and Falkville are small railroad towns, and Somerville, Center Grove, Eva, Laceys Spring, Valhermoso Springs, Florette, and Hulaco are small trading centers off the railroad.

The main line of the Louisville & Nashville Railroad crosses the county near its center, and the Memphis-Bristol line of the Southern Railroad crosses the northwestern corner. A number of boats ply

the Tennessee River, carrying much of the bulkier freight. There are a few miles of hard road in the county, within 12 miles of Decatur, Albany, Hartsells, and Falkville, and they enable many farmers to come to the railroad towns when otherwise access would be difficult. Many of the other roads are graded and drained, but during the winter months they are impassable for automobiles and heavily-laden wagons.

Rural mail-delivery routes have been established throughout the county and nearly every section has telephone service. Many modern school buildings have been erected throughout the county in recent years under the direction of the State board of education.

Nashville and Chattanooga, Tenn., and Birmingham are all within 100 miles of some section of the county and, together with the local towns, they furnish good markets for all the agricultural products.

CLIMATE.

The accompanying table, compiled from the records of the Weather Bureau station at Decatur, shows the normal monthly, seasonal, and annual temperature and precipitation. The data from this station are fairly representative of the climatic conditions throughout the county, except that the high mountain sections have slightly lower temperatures.

Normal monthly, seasonal, and annual temperature and precipitation at Decatur.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1904).	Total amount for the wettest year (1911).
	° F.	° F.	° F.	Inches.	Inches.	Inches.
December.....	42.3	72	0	4.10	4.50	11.52
January.....	41.7	77	-3	5.28	1.90	5.33
February.....	42.1	77	-12	5.16	1.25	5.05
Winter.....	42.0	77	-12	14.54	7.65	21.90
March.....	54.2	90	4	6.06	7.60	2.34
April.....	61.7	91	26	4.24	2.78	13.57
May.....	69.8	100	34	3.93	3.04	2.69
Spring.....	61.9	100	4	14.23	13.42	18.60
June.....	77.4	108	47	3.58	1.51	3.19
July.....	79.8	107	55	4.47	5.39	5.15
August.....	78.7	105	53	3.30	2.91	4.91
Summer.....	78.6	108	47	11.35	9.81	13.25
September.....	72.8	99	37	2.94	1.60	2.84
October.....	61.6	100	28	2.51	.30	4.66
November.....	50.8	85	10	3.33	1.92	3.62
Fall.....	61.7	100	10	8.78	3.82	11.12
Year.....	61.1	108	-12	48.90	34.70	64.87

Morgan County has a climate characterized by long, hot summers and alternating cold and warm periods during the winter. The mean annual temperature is 61.1° F. The mean temperature for the winter is 42° F., with extremes ranging from -12 to 77°. Abrupt and marked changes in temperature often occur during the winter. The mean temperature for the spring is 61.9° F. and for the summer 78.6° F. The maximum temperature recorded is 108° F. in June. The winds from the mountains have a tempering influence during the summer and the nights are usually pleasant.

The mean annual precipitation is 48.9 inches. The rainfall for the driest year on record (1904) was 34.7 inches and for the wettest year (1911) 64.87 inches. Almost 60 per cent of the rain falls during the winter and spring months. In many years the spring rains retard seeding and make it necessary to plant crops hastily in poorly prepared seed beds. The fall months normally are comparatively dry and allow ample time for harvesting.

The average growing season, 196 days in length, is long enough for maturing all the common crops. The average date of the last killing frost in the spring is April 5 and that of the first in the fall October 18. The latest recorded killing frost in the spring occurred on April 26; and the earliest recorded in the fall, on October 2. Such crops as turnips and cabbage, as well as field crops of rye, oats, and certain pasturage grasses, can be grown throughout the winter in normal years, and clearing of land, fencing, plowing, and similar farm work can be done during most of the winter.

AGRICULTURE.

The first large settlements in this county were made in the Tennessee Valley and near the river, which was the chief means of transportation. The red lands were the first of the valley soils to be cleared. Settlement spread to the Moulton Valley, and thence to the smaller valleys and coves along Cotaco Creek. The early settlers considered the mountain sections unsuited to the growing of crops, and the real value of that region was not known for many years. In fact, little or no attempt was made to clear and settle the mountain region until late in the nineteenth century, and only within the last 20 years has settlement of these parts of the county been rapid. The first settlers grew only such crops as corn, oats, wheat, rye, barley, sorghum, and fruit, which were all used on the farms where grown. Cattle and hogs were raised to some extent, the animals being marked and allowed to run at large. Early in the eighteenth century the growing of cotton became an important industry in the valley section, near the river, where transportation was available.

During the Civil War the greater part of the tilled land was thrown out of cultivation, but there has been a gradual reestablishment of

agriculture. About 45 years ago the North & South Railroad, now a part of the Louisville & Nashville, was completed across the county, and with the improved means of transportation and the bettering of the roads cotton has become an important crop in all parts of the county. The development of agriculture, as indicated by the size and condition of farms, from 1880 to 1920 is shown in the following table, compiled from the census:

Size of farms and proportion of improved land in Morgan County, 1880 to 1920.

Year.	Number of farms.	Percent- age of county in farms.	Improved land in average farm.		
			Average size of farms.		
			Acres.	Acres.	Per cent.
1880.....	2,352	73.7	117.8	42.2	36.2
1890.....	2,129	79.1	130.6	48.5	34.8
1900.....	3,079	72.4	88.4	39.2	44.4
1910.....	3,783	78.3	77.8	37.1	47.7
1920.....	4,344	72.0	62.3	35.5	57.0

Since 1900 the average value of all farm property per farm in Morgan County increased to \$1,549 in 1910 and to \$3,516 in 1920, largely owing to the rise in land values. In 1920 the average value per farm was \$3,516, of which the land represented 6.48 per cent, buildings 16.3 per cent, implements 5.1 per cent, and domestic animals 13.8 per cent.

There has been little change in the type of agriculture in Morgan County since 1880. Cotton occupies over 2½ times the acreage, however, while the production of hay and forage crops has increased many times. Wheat has gradually declined until it has become a crop of little importance, but in the last few years the war demands have caused a marked increase in the area devoted to this cereal. Corn has increased in acreage in the last decade while oats, which remained practically the same from 1880 to 1910, has fallen off in acreage in the last decade. The following table, compiled from the census reports, gives the acreage and production of the five principal crops from 1880 to 1920:

Acreage and production of principal crops in Morgan County, 1880 to 1920.

Census year.	Corn.		Cotton.		Oats.		Wheat.		Hay and forage.	
	Acres.	Bushels.	Acres.	Bales.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Tons.
1880.....	35,610	580,087	18,828	6,133	4,704	40,533	7,005	39,829	327	282
1890.....	38,048	611,984	23,618	6,227	6,395	72,260	968	6,309	1,534	1,782
1900.....	43,489	615,560	28,658	9,313	3,524	23,810	2,474	11,110	4,079	4,017
1910.....	40,591	571,987	37,527	12,863	5,777	69,611	485	3,746	7,271	7,943
1920.....	50,639	804,327	48,001	21,792	1,523	19,570	1,469	8,786	17,761	14,331

The principal sources of agricultural wealth are shown in the following table, which gives the acreage and value of the crops by classes, and also the value of the live-stock products sold, the figures being taken from the 1920 census and applying to the year 1919:

Acreage of crops, by classes, and value of crops, by classes, and value of live-stock products for 1919.

	Area.	Value.
	<i>Acres.</i>	<i>Dollars.</i>
CLASS OF CROPS.		
Cereals (corn occupying 94.4 per cent of acreage)	53,656	1,530,730
Other grains and seeds	522	11,967
Hay and forage	17,781	371,409
Vegetables	909	391,509
Fruits and nuts		107,996
All other crops (cotton occupying 98.4 per cent of acreage)	48,778	4,669,804
Total	121,626	7,083,415
LIVE STOCK AND PRODUCTS.		
Dairy products		47,036
Poultry and eggs		345,638
Wool and goat hair		487
Total		393,161
Grand total		7,476,576

The agriculture of Morgan County consists primarily of corn and cotton production. Of the 53,656 acres devoted to all cereals in 1919, 50,639 acres were in corn, which is the main subsistence crop. Corn is grown on all the soil types, but mainly on the bottom soils. In normal seasons large quantities of corn are sold, but occasionally heavy rains and floods "drown out" the bottom lands and the county has to import large quantities. The principal varieties of corn grown are Mosbys Prolific, Hastings Prolific, Tennessee Red Cob, Rockdale, and Hickory King, all dent corns. The average yield per acre in 1919 was 15.8 bushels.

Oats is the second cereal of importance. Brint, Hastings Hundred Bushel, and Fulghum are the principal varieties grown, in addition to some rustproof types.

Wheat was of little or no importance in 1909, but it has since increased considerably in acreage as a result of war demands. Many farmers have decided to grow at least enough for their own use. The area in wheat in 1919 is reported by census as 1,469 acres. Red Maiz, Fulcaster, and Bluestem are the leading varieties.

Cotton, the principal cash crop, is grown on all the cleared upland soils. The area in cotton in 1919 was 48,001 acres, and the average yield 0.45 bale per acre. The principal varieties grown are the Half-and-Half, Cleveland Big Boll, Cookes, and King.

In 1919, there were 17,761 acres devoted to hay and forage crops, of which 4,171 acres were in tame or cultivated grasses, 2,455 acres in grains cut green, 2,382 acres in wild grasses, 5,664 acres in coarse forage, and 3,089 acres of legumes cut for hay. Johnson grass, redtop, and red clover are grown by many farmers, and cowpeas, velvet beans, soy beans, and oats are common hay or forage crops. The various grasses are grown over all the county and with the exception of red clover, which does not thrive on the sandstone types, are not confined to any particular soils. Johnson grass seems to do best on the bottom soils. Crab grass and broom sedge grow naturally and are sometimes cut for hay, but they are very seldom seeded. Lespedeza grows naturally on the sandstone soils, and Bermuda grass when seeded does well on these soils. These two are the principal pasture grasses of the upland or mountain section and Bermuda grass or redtop and white clover are the principal pasture grasses in the valley region, the last volunteering on the limestone soils. There are a few patches of alfalfa in the county, but for the most part the crop has so far given indifferent returns.

Vegetables and fruits are produced in sufficient quantities to supply the home demand, but there are no large truck or fruit farms. Of the vegetable crops sweet potatoes occupy the largest acreage, with Irish potatoes second. In 1919 there were 36,127 apple trees and 35,397 peach trees in the county. Strawberries are grown by a few farmers. Of the wild fruits the blackberry is the most important.

Peanuts and velvet beans are becoming more popular each year. The latter crop does not always mature seed, but it makes an excellent forage and green-manure crop. It is usually planted in the cornfields, and makes such a heavy growth late in the fall after the corn has matured that the stalks are pulled down. The growing of these two legumes enriches the soil by adding organic matter and nitrogen.

Poultry raising is of considerable importance as a source of farm income. In 1919 there were 135,860 fowls of all kinds on farms, or an average of 32 per farm. In the spring and summer many hundred crates of eggs and chickens are shipped to the larger markets, and poultry products are produced in sufficient quantities to supply the home demand each year.

While nearly every farmer owns some hogs, horses, mules, and cows, not nearly enough are raised to supply the home demand, and many of these animals are imported from Tennessee and Kentucky each year. In 1919 there were 13,511 hogs on farms in Morgan County, or an average of about 3 head per farm. The boys' pig clubs and the efforts of the county agent have been instrumental in inducing farmers to improve the type of hogs raised, and to-day every hog shows some trace of good blood. The most common grade

animals consist of crosses of native stock with the Poland-China, Berkshire, Duroc-Jersey, or Chester White breeds.

Dairy cows in 1919 averaged between 1 and 2 per farm, or a total of 5,833 for the county; the dairy cows are, as a rule, small scrub animals, many showing slight traces of Jersey blood. Of late years many of the farmers have taken some interest in improving the live stock, and there are a number of registered bulls in the county to-day. Only a very few farms in Morgan County, near Decatur and Albany, can be classed as dairy farms. The creamery in Decatur imports nearly all the milk and cream used from Tennessee.

In 1919 there were 568 sheep and goats in the county. Farmers report that these animals are very profitable, as they make their living on land too rough to cultivate. Caves along many of the rough slopes of the mountains serve as a shelter, and aside from fencing the cost of raising these animals is very small.

Topography and soil characteristics have a marked influence on the extent and location of the areas farmed, and the kind of crops grown. In the stream bottoms and valleys only the better drained soils have been cleared, and in the mountains only those soils whose topography and drainage are best suited for crop production. Not all land suited to farming has been cleared and placed under cultivation in any section of the county. Some crops are more or less restricted to certain surface features and soils. Cotton is seldom grown in the flood plains, because of the danger of frost injury, but it is grown on all the upland soils. The bottom lands produce nearly all of the sorghum and a large proportion of the corn, while the bottoms and valleys together produce most of the hay. The mountain soils are best suited to peanuts, vegetables, and fruits of all kinds. Red and white clover seem to be restricted to the valley soils, while lespedeza grows naturally on the mountain types. The farmers as a whole consider the Hanceville and Dekalb fine sandy loams best adapted to fruit and vegetable production. The Pope and Huntington soils are considered best suited to sorghum, corn, and hay, and they are largely devoted to these crops. The Decatur clay loam is considered the strongest cotton soil in the county. Nearly all the red clover grown for hay is on the Decatur, Hagerstown, and Christian soils.

In growing corn the crop is allowed to stand on the stalk until dry, when it is pulled and stored in cribs. Often the corn leaves are pulled while green, tied in bundles, cured, and stored in barns to be fed in the place of hay to cattle and horses. A small percentage of the hay produced is baled, and the remainder is stored loose in the barns or stacked until fed. Cotton is picked in the late fall or early winter, taken to the gin to be baled, and sold later. The seed is sold to local mills or shipped to mills outside the county. Sorghum is usually made into sirup on the farm, the cane being run through a mill and

boiled in big pans over fireplaces built in or near the field. Part of the oats crop is thrashed, and the remainder is cut with the mower and fed to stock unthrashed. Wheat is usually harvested with a reaper and binder, thrashed, and sent to a local mill to be converted into flour. The surplus fruit and vegetables produced are canned on the farm for winter use. Most of the hogs are raised for home consumption.

The farm houses in Morgan County range from large, well-built frame buildings to 1 or 2 room tenant cabins. A few of the more prosperous farmers have running water in their houses, but on most farms a nearby spring or well supplies the water used. The barns as a whole are of medium size, usually containing several big box stalls for horses, cows, and sometimes pigs, a harness room, and usually a corn crib. The upper part of the barn is used for hay and other roughage. Wagon and implement sheds are often attached to the main barn. Many farms have separate buildings for storing corn. A few farmers who do their own repair work have a fairly well equipped blacksmith shop near the barn. The 1920 census reports the farm buildings as representing 16.3 per cent of the average value of all farm property. A so-called stock law is in effect over the county, and all the pastures are fenced. Barbed wire is generally used, though many farmers have fields inclosed with interwoven or "hog" wire.

The average farmer owns a few 1 or 2 horse plows, a wooden drag, smoothing harrows, cotton planter, and a 2-horse wagon. Many in addition own disk plows, disk harrows, corn planters, stalk cutters, mowers, fertilizer distributors, grain drills, hay rakes, and different types of cultivators. There are a number of manure spreaders and gasoline engines, and a few tractors. The average value of the implements in 1919 was \$179.41 per farm.

Land to be used for corn is usually broken to a depth of 4 to 8 inches late in winter or early in spring, and harrowed. One-horse plows are commonly used on the smaller farms and the sandier soils. On the uplands the land is ridged and the seed planted in the water furrow. In the bottoms the common method is to plant and cultivate level. The rows are spaced 3 to 4 feet apart. The seed is planted late in March or early in April. Some of the best farmers run over the field with spike-tooth harrow when the corn is breaking through the ground, and this practice is recommended by the State experiment station. Corn receives 3 to 5 cultivations before it is "laid by."

For cotton the best farmers break the ground about 6 to 8 inches deep early in the spring, and drag and harrow the field, mark off the rows, and plant and cultivate level. Some plow the ground, then ridge or bed it up and plant in the ridge. A few farmers, however, follow the plan of turning the previous year's ridge into the old

furrow, thus leaving part of the ground to be broken with the first cultivation. The seed is planted late in April or early in May, usually with a 1-horse planter, which opens the furrows and covers the seed. Cotton receives 3 to 5 cultivations, during the early part of the growing season.

Oats and wheat are usually drilled in after the seed bed has been harrowed and in some cases dragged. Wheat is sown in the late fall, while oats are seeded in February or March. Both crops mature in June or July.

No definite crop rotation is practical in this county, but many of the best farmers are beginning to follow a rotation consisting of cotton 1 year, corn 1 year, followed by wheat or oats, with which is sown clover or cowpeas. The red clover is broadcasted in the spring, and cut for the first time the same year, after the small grain has been harvested. Some farmers allow the clover to grow the next year, making a 4-year rotation. Red clover is only grown in the valleys, cowpeas taking its place in the mountain regions, where the rotation is always a 3-year one.

The census reports a total expenditure for fertilizer in 1919 of \$224,370, on 3,402 farms, or an average of \$66 each. The farmers are still using about the same quantity as in former years. The fertilizers in most general use analyze 10-2-2.¹ Some farmers use a home mixture of cottonseed meal and phosphoric acid. Cotton and some of the upland corn receive practically all of the fertilizer, and stable manure is also used on these crops. The supply is inadequate, however, and some farmers plow under red clover, velvet beans, cowpeas, or soy beans. Fertilizer is usually applied in the row at planting time, at the rate of 200 to 400 pounds per acre.

Colored labor is important in the agricultural economy of the Tennessee Valley, and in communities here and there on Little Mountain and in the other valleys, but in many sections throughout the county, as on the higher mountain areas, there are no colored persons and all the labor is performed by the white farmers and their families. In normal times sufficient labor is available, but since 1914 labor has been growing more scarce each year. Formerly the average price paid ordinary farm laborers by the month was \$15 to \$25 and board, and that paid day laborers, 75 cents to \$1. In 1918 wages by the month ranged from \$25 to \$35, and board, while day laborers received \$1 to \$1.75 a day, with meals. Cotton pickers in normal times receive 50 to 75 cents a hundred pounds, but at the time of making the survey (1917) when labor was scarce and cotton brought high prices, the pickers received 75 cents to \$2 a hundred pounds, depending upon the field. Most of the crop was gathered for about \$1 a hundred.

¹ Formula stated in the order, phosphoric acid, nitrogen, potash.

The 1920 census reports the average size of farms in Morgan County as 62.3 acres, of which 35.5 acres are improved. The farms vary in size from a few acres to 5,000 or more. The largest farms are in the valleys, where many of them represent plantations of antebellum days. Most of the mountain farms are small, as they have been cleared since the Civil War and for the most part are operated by the owner. One tenant farmer on the larger farms works about 35 to 40 acres of land, and this is about the extent of the cleared acreage on many of the mountain farms. In regions where tillable land lies adjacent to rough or stony areas it is often necessary for a farmer to control two or three hundred acres in order to have 30 or 40 acres of farming land.

The larger farms are rented to tenants, who handle 30 to 40 acres each. The 1920 census, which classes each tenancy as a farm, reports 54.5 per cent of the farms operated by tenants, 45.4 per cent by owners, and 0.1 per cent by managers. Most of the tenant farms are operated on a share basis. In most cases the owner furnishes the equipment, half the fertilizer, and all the seed, and receives half of all the crops. Often the operator furnishes everything but the land and buildings and gives the owner one-third of the corn and one-fourth of the cotton.

Farm land varies considerably in value in Morgan County. The average assessed value per acre in 1910 was \$11.56, but since then, owing to the higher prices received for all farm products, land has increased considerably in value, and the 1920 census reports the average assessed value as \$36.57 per acre. The stony or broken areas are valued chiefly for the timber, while the rolling red lands near Decatur are valued at \$50 to \$60 or even more an acre.

SOILS.²

Morgan County lies within the Appalachian Mountain and Limestone Valleys soil provinces. The soils are largely derived from the underlying formations,³ whose name, age, and thickness are shown in the following table:

² Morgan County adjoins Lawrence County on the west, Cullman County on the south, and Marshall County on the east. Along the boundaries the soils of Morgan County do not agree with those of Cullman and Marshall counties. This is due to changes in correlation resulting in a fuller understanding of the soils in this part of the State. In certain cases the maps do not join along the Morgan and Lawrence boundaries. The differences result largely from the more detailed mapping done in the later survey. Where boundary differences appear in these maps, the names used in Morgan County should be applied to the abutting soils in the earlier surveys.

³ The discussions of geology in this report are based upon "The Valley Regions of Alabama; Part I, The Tennessee Valley Region," Geological Survey of Alabama, 1896.

Principal geological formations of Morgan County.

Age.	Formation.	Depth.
		<i>Feet.</i>
Tertiary.....	Lafayette.....
Carboniferous.....	Coal measures.....	300
Upper subcarboniferous.....	{Bangor limestone.....	400-425
	{Hartselle sandstone.....	200-300
Lower subcarboniferous.....	Tuscumbia or St. Louis limestone.....	125

The Tuscumbia or St. Louis limestone, which shows a thickness of about 125 feet above drainage level, occupies about 25 square miles in the western half of the county, where it reaches the Tennessee River and extends 2 or 3 miles south of it. This limestone is gray to blue, with some interstratified chert. Little rock is seen on the surface. The drainage is partly effected by underground channels. The weathering of the St. Louis limestone has given rise to many of the limestone soils. From it have been derived the largest and most important areas of the Decatur and Hagerstown soils and a small proportion of the more poorly drained Colbert soils.

The Hartselle sandstone, which forms the surface rock of the Little Mountain region, consists of gray, red, or yellowish sandstone, together with associated arenaceous shales and calcareous sandstones. This formation is 200 to 300 feet thick. In many places along the north escarpment of Little Mountain there are numerous coves and "sinks," marking places where erosion has worn through the softer sandstone and into the soluble limestone, through which underground drainage channels have been cut. The soils formed by the weathering of the sandstone and shale rocks are included in the Dekalb and Hanceville series, except for some small poorly drained areas, which form isolated bodies of Lickdale silt loam.

The Bangor limestone, occurring in the valleys, is a massive, gray to blue limestone, giving rise to all the limestone soils except those which overlie the St. Louis formation. It also extends up the steep mountain slopes and outcrops in small areas in the valleys in the form of glades. The soils formed from this rock are mainly the poorly or imperfectly drained Colbert and Hollywood soils, which surround smaller bodies of the better drained Decatur and Hagerstown types.

The Carboniferous or Coal Measures formation covers about 160 square miles, capping the high mountains. The rocks consist of red, gray, and mottled sandstone, with associated arenaceous and argillaceous shales. Occasionally a gray or reddish conglomerate, cemented with sandstone and containing small white quartz pebbles, outcrops on slopes. In places the drainage is effected through underground channels similar to those in the case of Little Mountain, but

some of the streams which flow from the base of the mountains are wide, deep creeks. Occasionally the surface arch has broken, forming big sinks, of which the Newsome Sinks are the largest. The Dekalb, Hanceville, and Lickdale soils are derived from the Coal Measures rocks.

On the lower slopes of the mountains and in a few other places where the soils seem to have been influenced by both sandstone and limestone materials, they are correlated with the Christian series.

The Tertiary material which once capped part of the county has been eroded until it seems to have little or no influence on the soils. Along the north escarpment of Little Mountain, northeast of Somerville, there are a number of spots where rounded, waterworn gravel is encountered which may owe its origin to this material, but it is thought that the finer soil material is largely of sandstone origin, and consequently these soils are included with the Hanceville gravelly fine sandy loam.

The first-bottom soils, which are subject to overflow, are classed with the Huntington, Holly, and Pope series, depending upon the nature of the material and the state of drainage. The second-bottom soils of the county are confined to the northeastern corner and are classed with the Elk series.

The soils of the Decatur series are characteristically reddish brown to deep red, with bright-red or blood-red clay subsoil. The Decatur soils are derived mainly from limestone, but some areas show traces of chert.

The soils of the Hagerstown series are prevailingly brown, with light-brown to reddish-brown subsoils. The red color is never so pronounced as in the Decatur series. The Hagerstown soils are derived mainly from limestone, which in many places contains chert.

The Colbert series includes types with gray to yellow surface soils and a rather plastic, heavy clay subsoil, mottled gray and yellow, or yellow. Typically, numerous iron concretions are scattered over the surface and throughout the soil mass to a depth of 3 feet. These soils are derived largely from limestone, though sandstone probably has had some influence. They are typically developed in nearly level places. A slope phase is mapped with this series. It consists largely of colluvial wash from sandstone soils, deposited over Colbert clay material.

The Hollywood series is characterized by its black or dark-gray to dark-brown surface soils and heavy plastic, dark-gray or black to mottled yellow and gray, subsoils. The members of this series owe their origin to the breaking down of limestone rock. They occupy low, flat positions, usually near the base of the higher mountains and often bordering streams.

The surface subsoils of the heavier members of the Christian series are brown to reddish, while the more sandy types are grayish brown. The subsoil is a reddish, friable clay, in places rather compact but seldom sticky. These soils are derived from interbedded sandstone and limestone formations, fragments of which are seen on the surface, with some chert and shale in places. The Christian soils are developed in the valleys near the mountain bases, at elevations slightly above the limestone soils.

The surface soils of the Dekalb series are gray to brown, and the subsoils commonly some shade of yellow. The members of this series are derived, through weathering, from sandstone and shale of the Appalachian Mountains. The surface features consist of gently rolling table-lands, hills, and mountains.

The types of the Hanceville series have grayish brown to reddish surface soils and red, friable subsoils. They are derived from sandstone and shale. Their topography is more rolling than that of the Dekalb soils.

The Lickdale soils have gray surface material and heavy, plastic, mottled gray and yellow, clay subsoils. The members of this series are derived from colluvial deposits as well as from poorly drained bodies of Dekalb and Hanceville material, and are developed in wet depressions on the mountain tops or at the base of steep slopes.

The members of the Elk series have light-brown to brown soils and pale-yellow to yellow subsoils. This series is developed on second terraces lying mainly above normal overflows. The material consists of alluvium largely derived from soils of limestone origin.

The Huntington series have light-brown to brown soils, with yellow to light-brown subsoils. In places there is little change in color or character of the materials throughout the 3-foot section. These soils for the most part consist of reworked material of limestone origin.

The Holly series is characterized by its ashen-gray to whitish surface soils and gray or mottled yellow and gray subsoils. It differs from the Huntington in occupying the lower or wetter portions of the first bottom. Like the Huntington soils, the members of this series represent reworked limestone material. They are similarly subject to overflow.

The members of the Pope series are light brown to brown in the surface portion and brown or yellow in the subsoil, with some mottling in the lower part of the 3-foot section. They are alluvial soils, consisting largely of reworked Dekalb and Hanceville material.

The various soils of Morgan County are grouped into series on the basis of origin, color, and structural and drainage characteristics. The types, or units of soil classification, are separated within the series on the basis of texture and content of gravel. In addition to

the 24 soil types, with two phases, included in the 12 series identified in Morgan County, two miscellaneous classifications, Rough stony land and Rough broken land, are recognized.

In following pages of this report the various soils are described in detail and treated in their relation to agriculture. The distribution of the soils is shown on the map accompanying this report. The following table gives the name and the actual and relative extent of each type:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb silt loam.....	52,544	14.0	Hanceville gravelly fine sandy loam.....	5,760	1.5
Hanceville fine sandy loam...	47,552	12.6	Hollywood clay.....	5,504	1.5
Rough stony land.....	40,448	10.8	Hagerstown loam.....	4,160	1.1
Colbert silt loam.....	37,440	10.0	Decatur silt loam.....	3,904	1.0
Dekalb fine sandy loam.....	29,504	8.3	Holly silt loam.....	3,648	1.0
Gravelly phase.....	1,536		Hagerstown gravelly loam....	3,392	.9
Decatur clay loam.....	23,936	6.4	Decatur fine sandy loam.....	2,880	.8
Colbert fine sandy loam.....	17,664	6.3	Pope fine sandy loam.....	1,984	.5
Slope phase.....	6,016		Christian clay loam.....	1,856	.5
Huntington silty clay loam...	18,880	5.0	Huntington fine sandy loam..	1,664	.4
Pope silty clay loam.....	16,448	4.4	Elk loam.....	1,600	.4
Rough broken land.....	14,784	3.9	Lickdale silt loam.....	1,472	.4
Hagerstown fine sandy loam..	10,880	2.9	Elk fine sandy loam.....	1,408	.4
Colbert clay.....	10,688	2.8			
Christian fine sandy loam....	8,128	2.2			
			Total.....	375,680

DECATUR FINE SANDY LOAM.

The Decatur fine sandy loam consists of a reddish-brown, red, or light-brown fine sandy loam, underlain at 6 to 10 inches by a deep-red, moderately friable clay, which becomes heavier in the lower part of the 3-foot section. Some dark iron concretions occur throughout the soil and subsoil, but ordinarily few stones except for a few chert fragments are found in this soil. The bedrock lies several feet below the surface and very seldom outcrops. Included with the type as mapped are several small bodies of Decatur silt loam and clay loam.

This is a valley soil occurring most prominently west and northwest of Decatur. It is very closely associated with the Decatur clay loam, and occupies the crests of the rolling hills or areas near the base of the gentle slopes. Because of its position and the loose, sandy surface soil heavy rains cause more or less damage by washing out plant food and eroding the surface. The type is well drained.

Although of small extent, the Decatur fine sandy loam is an important agricultural soil. Nearly of all it is cleared and devoted to the production of cotton, corn, with smaller acreages in oats, wheat, and hay. As in case of the other members of the series, red clover is grown to some extent and its acreage is increasing each year.

Peaches, apples, strawberries, and vegetables, such as peas, beans, sweet potatoes, Irish potatoes, and sweet corn, are produced in small quantities, and they give better results than on the heavier members of the series. Yields of cotton, corn, and grain are, however, not as large as on the Decatur clay loam.

The selling value of this land is hard to determine, because few farms are located on this soil alone, but in general it is held at \$5 to \$10 an acre less than the prices asked for the Decatur clay loam.

The Decatur fine sandy loam is low in organic matter, and much of it has been devoted to cotton so constantly that it is "run down." Stable manure or green-manure crops, preferably velvet beans, red clover, crimson clover, cowpeas, or soy beans, should be plowed under and a regular rotation of crops followed.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Decatur fine sandy loam:

Mechanical analyses of Decatur fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415913	Soil	0.0	0.9	2.8	53.2	12.8	21.6	8.4
415914	Subsoil0	.6	2.2	37.4	8.2	27.7	23.6

DECATUR SILT LOAM.

To a depth of 8 to 13 inches the Decatur silt loam consists of a dark-brown or chocolate-brown silt loam, underlain by a red silty clay loam. This passes into deep-red clay subsoil, which ordinarily is not so red as that of the Decatur clay loam. The lower subsoil of the silt loam is slightly more compact than that of the clay loam. In many places the surface soil is directly underlain by the deep-red, friable clay. Patches of silty clay loam are included with the type as mapped. Some of the heaviest material is found in depressions or sinks, as, for example, the small areas mapped 2½ miles west of Decatur along the Courtland pike.

The type is associated with the Decatur clay loam, and the largest areas are mapped in the western half of the county, just south of the river. It occupies depressions surrounded by the higher and more rolling areas of Decatur clay loam, which has undoubtedly contributed the surface soil as colluvial wash. In wet seasons water sometimes stands on the surface for a little while, but in general, the underdrainage is good.

Farmers prize the Decatur silt loam, considering it a good, strong soil, comparing very favorably with the Decatur clay loam. Nearly all the type is cleared and used for the production of cotton, corn, and, to a less extent, for oats, wheat, and hay. The yields, as well as the

methods of handling and fertilization, are about the same as on the heavier types. In wet seasons, however, the soil dries out more slowly. It is naturally somewhat easier to cultivate. Because of its lower position and consequent tendency to acidity, liming would probably be of greater benefit than on the Decatur clay loam.

DECATUR CLAY LOAM.

The Decatur clay loam, to a depth of 6 or 8 inches, is a reddish-brown to red clay loam, overlying a deep-red or blood-red, friable clay which becomes more compact in the lower subsoil. There are varying quantities of small brown and black ferruginous concretions, and in places where these have partly decomposed the subsoil has a mottled appearance. Much of the type as mapped has a surface covering of 1 to 3 inches of red fine sandy loam, but plowing mixes sufficient of the underlying clay with the coarse material to form a clay loam soil. As a whole, the type is not very uniform in texture. Here and there on the steeper slopes the surface soil has been washed away, exposing the underlying clay. In other places the type includes small areas of fine sandy loam and silt loam.

This is strictly a lowland-belt soil, characteristically developed in the Tennessee and Moulton Valleys. The largest and most important areas extend a distance of 2 or 3 miles south of the river bottom in the western half of the county. Many large bodies are situated through the several valleys, often occupying islandlike knolls surrounded by the poorly drained Colbert silt loam. The topography is gently rolling, and both the run-off and subsoil drainage are adequate. The type is more or less subject to erosion.

The Decatur clay loam is one of the strongest and most highly prized soils in the county. It is spoken of locally as "red land," and was one of the first soils to be cleared by the early settlers. The original timber growth consisted principally of white oak, red oak, Spanish oak, black oak, hickory, and some red cedar, walnut, and shortleaf pine. Nearly all the type has been cleared, and it is used largely for the production of cotton and to a less extent corn. The minor crops grown are oats, wheat, and hay (red clover and redtop, with a very limited acreage of alfalfa and timothy). Some farmers in recent years have been growing velvet beans or cowpeas with corn, to improve the soil. Nearly all the farmers have a garden and small orchard in which vegetables and fruit are grown in sufficient quantities to supply the home demand. Cows, hogs, and chickens are generally kept only in sufficient numbers to supply the home needs. The mules and horses used as draft stock are very seldom raised on the farms.

The average yield of cotton on this soil is about one-half bale per acre, although some farmers report as much as 2 bales per acre.

Corn yields between 20 and 40 bushels, oats 25 and 45 bushels, and mixed hay between 1 and 1½ tons per acre.

This soil is usually plowed in the spring with 2-horse plows and harrowed. Cotton is planted on ridges or in level rows, while corn is usually planted in the water furrows. Oats and wheat are sown or drilled. All the available stable manure is used, but the supply is so small that nearly every farmer uses a considerable amount of commercial fertilizer. A 10-2-2 fertilizer is used by most farmers, though some use a home mixture of cottonseed meal and phosphoric acid. The fertilizer for cotton and corn is applied in the row at planting time in amounts of 200 to 400 pounds per acre.

The areas of this type best situated and most highly improved bring as much as \$40 to \$60 an acre, but many areas sell around \$20 an acre.

The Decatur clay loam as a whole has been farmed for so many years without crop rotation and proper fertilization that it would be greatly benefited by systematic management. Many of the best farmers are beginning to rotate crops, and find that the yields are steadily increased. A rotation that has been found to give good results is as follows: Cotton, followed by corn, with which velvet beans are seeded to be fed to hogs or cattle; after the corn is harvested plow and drill in wheat and in the spring broadcast red clover. After harvesting the wheat a cutting of red clover can be obtained. Plow the sod late in the fall, and plant to cotton again the next year. The cotton and corn land should be fertilized with stable manure or commercial fertilizer. The Tennessee Agricultural Experiment Station reports that liming increases the yields of all crops on this soil. Lime should be applied once every four or five years, preferably in the fall, before drilling wheat. A few farmers have found that corn is greatly benefited by applying small quantities of nitrate of soda near the rows just after the young plants are about 12 inches high.

HAGERSTOWN GRAVELLY LOAM.

The Hagerstown gravelly loam, to a depth of 8 to 12 inches, consists of a brown or reddish-brown, mellow loam, underlain by a red, reddish-brown, or brown, friable clay. From 25 to 60 per cent of the 3-foot section is composed of angular chert fragments, mainly small, though in places some of the fragments are fairly large. Some areas have a relatively large percentage of fine sand in the surface few inches of soil.

Along the base of the high mountains, as in the southeast corner of the county north of Pleasant Ridge Church and south of Center Grove, the soil as mapped is really the Frederick gravelly loam, as it is largely derived from a light-colored chert and has a gray to yellow surface soil and a slightly more compact subsoil than is ordinarily found in the Hagerstown soils.

The largest and most important areas of Hagerstown gravelly loam lie in the Tennessee Valley just north of Trinity. Scattered areas are found in other valleys and on the lower slopes or at the base of the mountains. The topography varies from gently rolling to sloping, and the drainage is good.

This is not an extensive soil, but it is nearly all cleared. The few forested areas are covered with the principal hardwoods common to the valley soils, particularly the Hagerstown fine sandy loam.

Cotton is the principal crop on this soil, with corn second. Oats, wheat, and hay crops are of minor importance. Part of the type is pastured, white clover and Bermuda grass forming the principal growth.

The gravel content makes tillage more difficult than is the case with the other Hagerstown soils, but the methods of soil management and the yields differ little. As most of the areas are small, it is hard to give the selling value of the type with any accuracy, but in general the farmers consider it to be of lower value than the loam or fine sandy loam soils.

HAGERSTOWN FINE SANDY LOAM.

The Hagerstown fine sandy loam consists of a light-brown or grayish-brown fine sandy loam, underlain at 8 to 10 inches by a reddish-yellow clay loam or clay which passes quickly into a friable, reddish-brown clay. Frequently the reddish-yellow layer is wanting, and often the lower subsoil is slightly mottled with gray. Small fragments of chert and limestone are often scattered over the surface, but never in sufficient quantities to interfere with cultivation. In many places small iron concretions are encountered throughout the soil section. The underlying limestone is usually several feet below the surface, and few outcrops are seen. Some patches of Colbert fine sandy loam and Hagerstown loam, too small to separate, are included with the type as mapped.

The Hagerstown fine sandy loam occupies many scattered areas in the lowland belts of the county. Some of the larger are mapped in the Tennessee Valley near Cedar Lake station, and south and southwest of Austinville. It lies between the lower Colbert fine sandy loam and the higher Decatur soils, and has a nearly level to gently rolling surface, with good drainage.

The Hagerstown fine sandy loam is of considerable importance in the agriculture of the county. It is all under cultivation except for small scattered areas which still support the native timber. The growth is principally hardwood, such as white oak, red oak, Spanish oak, black oak, hickory, walnut, dogwood, and wild plum.

The cultivated areas are devoted almost entirely to cotton, with corn second in importance. The minor crops consist of oats, wheat, and hay. Red clover, redtop, some timothy, and such crops as oats,

cowpeas, soy beans, and velvet beans are used for hay. Peaches, apples, and strawberries are produced in small quantities for home use. Dairy cows, hogs, and chickens are kept by nearly every farmer in small numbers.

Yields vary considerably on this soil, depending on the state of productiveness and the farm management. Average yields per acre are about as follows: Cotton, one-half to 1 bale, corn 18 to 35 bushels, oats 20 to 40 bushels, wheat 10 to 20 bushels, and mixed hay three-fourths ton to 2 tons.

The ground for all crops is plowed in the spring or in the late winter months. It is broken from 4 to 8 inches deep, generally with 2-horse turning plows, after which it is harrowed. Cotton is planted level or on ridges, while corn is usually planted in a water furrow. Small grain is drilled or sown, wheat being put in about November and oats nearly always in the spring. Almost all the fertilizer used is applied to cotton land, though many farmers also make application to the land to be planted in corn. The fertilizer is distributed in the row at the time of planting, in amounts ranging from 200 to 400 pounds per acre. A 10-2-2 fertilizer is in most general use. Since the price of fertilizer has advanced many of the farmers on this soil have been using cottonseed meal mixed with phosphoric acid in place of commercial brands. Some farmers add wood ashes to this mixture, the ashes being obtained where brush has been burned in clearing the land. A very few farmers use nitrate of soda in small quantities on corn just after the growth is well started.

Land values on the Hagerstown fine sandy loam vary from \$20 to \$50 an acre, depending upon the location with reference to roads and towns, as well as the state of productiveness and the improvements.

The Hagerstown fine sandy loam is naturally a strong soil, but because it has been used for cotton production for so many years with little attention to the maintenance of productiveness, much of the land is in a "run down" condition, and few areas are producing the maximum returns. More effort should be made to increase the supply of organic matter, and the land should be limed, plowed deeper, and more thoroughly prepared for planting. Crop rotations should also be planned and followed systematically.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Hagerstown fine sandy loam:

Mechanical analyses of Hagerstown fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415935.....	Soil.....	1.1	2.5	4.7	40.2	15.0	31.4	4.6
415936.....	Subsoil.....	1.0	1.6	2.8	22.0	10.8	44.3	18.9

HAGERSTOWN LOAM.

The Hagerstown loam, to a depth of 6 to 10 inches, consists of a reddish-brown, mellow loam, overlying a yellowish-brown or reddish-brown to dull-red, friable clay loam or clay. In many places iron concretions occur throughout the soil section, and here and there some small fragments of chert and limestone are mixed with the soil material. The underlying limestone very seldom outcrops. Included with the type in the vicinity of Massey and Penn School are small areas which differ from the typical in having a relatively high percentage of silt in the surface soil.

The Hagerstown loam is strictly a lowland-belt type, occurring in rather small, scattered bodies in several of the limestone valleys. The largest areas lie within a radius of 3 miles of Priceville. The type usually occupies more nearly level areas than the fine sandy loam, but has about the same elevation. It is naturally well drained.

Only a small acreage of this type occurs in the county, but most of it has been cleared and is devoted to the same crop as the fine sandy loam type. It is considered by farmers to be a stronger soil, and crops give slightly larger yields. The type is handled and fertilized in the same manner as the fine sandy loam, and has about the same selling value for correspondingly well situated and improved farms. Like the fine sandy loam it has been impaired by the constant growing of cotton and requires a change of crops, deep plowing, liming, and the addition of organic matter to restore it to its former state of productiveness.

COLBERT FINE SANDY LOAM.

The Colbert fine sandy loam, to a depth of 6 to 10 inches, consists of a light-brown to yellowish-brown or grayish-brown fine sandy loam, overlying a yellow, stiff, plastic clay, which is mottled in the lower subsoil with gray and yellow. In many places the mottlings are very faint, but in others the upper as well as the lower subsoil is strongly mottled. There are usually present varying quantities of small dark iron-oxide concretions, some of which have disintegrated and caused dark-brown markings in the subsoil. The underlying limestone is often close to the surface, and in a few places outcrops are shown on the map by symbol. Near the lower foothills of the mountain section there are some small areas in which the material may have been influenced by sandstone. In many of the larger areas there are some depressions occupied by the Colbert silt loam, but these could not be separated satisfactorily on a map of the scale used in this survey. Where the type occupies a relatively high elevation, the subsoil has a light-yellow color and the mottlings are absent or very faint.

The Colbert fine sandy loam is found in small patches throughout the valley sections. Some of the larger and most continuous areas are mapped near Austinville, Trinity, Curtis Well, Cedar Lake, and Chestnut Grove Church. The type occupies level or flat areas and low ridges, all of which are slightly elevated above the associated Colbert silt loam. Drainage is much better established than in the heavier member of the series, but much of the type requires artificial drainage. Some farms have been improved with systems of tile drains.

This is one of the most extensive of the valley soils, and much of it is cleared and cultivated. The native forest consists of the hardwood growth common to the valley soils. The principal crops, in the order of importance, are cotton, corn, oats, hay, wheat, and vegetables. Cotton is the principal source of income. The other crops are used mainly on the farms where grown. Part of the type is in pasture, Bermuda grass and white clover forming the chief growth.

Cotton on this soil yields from one-fourth to three-fourths bale per acre, corn 20 to 30 bushels, and oats 15 to 35 bushels. On many of the best-managed farms much larger yields are obtained. The soil is handled and fertilized in the same way as the other limestone types. To increase the yields generally the drainage should be improved, and the land limed and stored with organic matter, in which it is deficient.

Colbert fine sandy loam, slope phase.—The Colbert fine sandy loam, slope phase, consists of a grayish-brown, light-brown, or reddish-yellow fine sandy loam, from 4 to 10 inches deep, overlying a yellow, plastic clay which usually has a greenish cast. In many places the subsoil consists of a stiff, plastic, light-reddish clay, which becomes yellower with depth. Small chert and sandstone fragments are common on the surface and in some places the underlying limestone outcrops

This phase occurs in small, irregular strips near the foot of the sandstone mountains. It differs from the typical soil not only in its sloping topography, but also in the origin of the surface soil, which consists of colluvial material from the higher sandstone slopes washed over the heavy clay of limestone derivation. The surface soil is subject to erosion, and heavy rains cause considerable damage to growing crops. The subsoil is of such stiff, plastic nature that the underdrainage is imperfect.

Very little of this soil has been cleared. The principal tree growth consists of cedar, hickory, white oak, red oak, black oak, and some shortleaf pine. Where it is farmed cotton and corn are grown, with varying results, depending upon the steepness of the slope and the depth of the surface soil, as well as the methods of handling. Some

of the phase as mapped closely resembles the typical fine sandy loam, and gives equally as good results.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the typical Colbert fine sandy loam:

Mechanical analyses of Colbert fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415921.....	Soil.....	0.0	1.2	3.0	53.1	15.4	17.8	9.3
415922.....	Subsoil.....	.0	.3	1.6	35.3	11.7	24.7	26.1

COLBERT SILT LOAM.

The Colbert silt loam, to a depth of 6 to 10 inches, consists of a light-gray to whitish silt loam overlying a plastic, mottled gray and yellow clay. Numerous iron-oxide concretions are found on the surface and throughout the soil section, in many places occurring in abundance in the lower subsoil. As a rule in wooded areas the surface inch is dark brown or brown, owing to the incorporation of vegetable matter. Some of the areas mapped with this type differ from typical in having a darker surface soil, ranging from grayish brown to gray or brown. They are mainly found near large streams and are covered with many feet of water at times, but do not seem to be of alluvial origin. Included with the type as mapped are some small bodies of Hollywood clay and Colbert clay. In a few places small fragments of chert are noticed, and occasionally the limestone bedrock outcrops, or is encountered within the 3-foot section.

The Colbert silt loam is one of the most extensive soil types in the valley sections of the county. Some of the largest areas are mapped along the bottoms of Witt Creek, No Business Creek, Scrouge About Creek, and Flint Creek, and in the Moulton Valley. Others are mapped in Cedar Cove and in the vicinity of Six Mile School, Austinville, and Curtis Well. The type occupies low, flat depressions spoken of locally as "swamps" or "bottoms," owing to the fact that the water table is very close to the surface and during wet seasons water stands on the surface for many days at a time. Drainage of both surface soil and subsoil is very poorly established, and the type is often spoken of as "crawfish land." Most of it is forested, and it is of little importance in the agriculture of the county. Only a very few of the higher and better drained areas have been cleared. The timber growth consists principally of water oak, sweet gum, black gum, elm, willow, shagbark hickory, and beech. Bermuda grass and lespedeza as well as many other grasses afford good grazing, and remain green during periods of drought. The few cleared areas

are used for the production of corn, cotton, and oats, the yields of which are low when compared to those obtained on the more elevated soils. In a general way, the same crops are grown as on the fine sandy loam, and the soil is handled in a similar manner. Its selling value ranges from \$10 to \$20 an acre, depending largely on the timber.

The Colbert silt loam as a whole is in need of drainage. Much of it would be difficult to drain with a reasonable expenditure, but where this can be accomplished grass and other shallow-rooted crops should give fair returns. The addition of lime and organic matter would be important steps in the complete reclamation of this type.

COLBERT CLAY.

The surface soil of the Colbert clay consists of a yellow or olive-colored, very stiff, plastic, tough clay, underlain in many places by a subsoil similar in all respects except that it contains some faint yellow or reddish mottlings in the extreme lower part. Some of the type as mapped differs in color from the typical, the range being from reddish brown or reddish yellow on some of the steeper slopes to dark gray or dark yellow on the more nearly level areas bordering the Hollywood clay. The lower subsoil, however, is normally yellow, even where the surface soil is reddest or darkest. Small dark iron concretions occur in varying quantities in nearly all the areas mapped. The underlying limestone rock is relatively close to the surface, often within the 3-foot section, and many outcrops occur. Where prominent these are shown on the map by symbol.

Small particles of sandstone, limestone, and chert occur in places on the surface, especially on the steeper slopes and at the base of abrupt mountain slopes.

The Colbert clay is a valley soil, occurring usually in narrow strips on the lower north slopes of Little, Whitesburg, and other mountains, and lying in many cases between the Rough broken land or Rough stony land of the mountain slopes and the lower, more nearly level valley soils. It occupies a higher position than most of the strictly limestone soils.

Surface drainage is good on the slopes, but the underdrainage is poor owing to the impervious nature of the soil and subsoil. Very little of the type is farmed, most of it being forested with cedar. In many areas this tree seems to have crowded out all other growths, but white oak, black oak, chesnut oak, red oak, and gum are fairly abundant in places. Some cotton and corn are grown, but the yields are rather low. Grasses do well and good pasturage is afforded on some areas of the type.

The selling price of this land is low. It is valued mainly as pasture land and for its forest products.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Colbert clay:

Mechanical analyses of Colbert clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415929.....	Soil.....	0.2	0.5	0.4	10.0	5.4	24.6	58.9
415930.....	Subsoil.....	.4	.4	.3	10.4	5.8	23.3	59.5

HOLLYWOOD CLAY.

The surface soil of the Hollywood clay extends to a depth of 6 to 8 inches and is a black to dark-brown or dark-gray heavy clay, underlain by a black, tenacious clay which grades into a drab or slate-colored, stiff, plastic clay. The lower part of the 3-foot section is generally mottled with gray and yellow. Iron concretions in varying numbers are found throughout the subsoil. Bordering areas of Decatur clay loam in the neighborhood of Lebanon Church the surface few inches consists of red loam washed from the adjacent type. The areas mapped northwest of Danville along the Lawrence County line differ from typical in containing larger quantities of silt in the surface soil, and the subsoil from 8 to 12 or 15 inches consists of a dark slate colored, plastic clay which becomes mottled pale yellow and gray below. Frequently the underlying limestone is encountered within 3 feet of the surface, and ledges of this formation outcrop in places. A few small areas of Colbert clay, owing to their small extent, have been mapped with this type.

The Hollywood clay occurs in small areas in the Moulton and Cotaco Valleys. The largest developments are mapped southeast of Mount Tabor School, east of Leesdale, near Cedar Plains Church, southwest of Woodall Bridge, and northwest of Danville.

Drainage is poorly established, owing to the flat surface and the heavy, impervious subsoil, and only a small percentage of the type has been cleared. The principal timber growth consists of water willow, red oak, white oak, black oak, chestnut oak, Spanish oak, dogwood, hickory, shagbark hickory, swamp cedar, sweet gum, black gum, beech, and ironwood.

Corn, hay, oats, and wheat are the chief crops grown. Corn, which occupies the largest acreage, produces excellent yields in favorable seasons, but ordinarily the yields of all crops are low.

The soil is difficult to handle. Farmers state that if this soil is plowed when the moisture content is not just right it puddles and fails to scour from the plow. Heavy farming equipment is necessary. When properly drained, limed, and supplied with organic

matter this soil should prove one of the strongest in the county for the production of corn, grain, and hay.

The Hollywood clay is generally sold in conjunction with adjoining soils, and is valued at \$15 to \$25 an acre.

CHRISTIAN FINE SANDY LOAM.

The Christian fine sandy loam consists of a light-brown to dark-brown fine sandy loam, underlain at 8 to 12 inches by a reddish-brown to deep-red, heavy clay loam which grades quickly into moderately friable clay of the same color. Small fragments of chert, sandstone, and limestone are scattered over the surface and through the soil in varying quantities. Areas where they occur in sufficient numbers to influence cultivation are shown by gravel symbols. In the southeast corner of the county, near Center Grove, and in Jackson, Winton, and Lemmon Coves the type as mapped contains large quantities of small white quartz pebbles, whose origin is traced to a sandstone conglomerate. Occasional ledges of sandstone and limestone outcrop. The small areas mapped as Christian fine sandy loam east and south-east of Leesdale differ in having a subsoil, yellow in the upper part and passing through a mottled yellow and red clay loam or clay into a red clay in the lower part of the section. Some of the slope areas near the higher mountains are marked with "gall spots," caused by washing away of the surface soil and the exposing of the underlying clay. Here the texture is often a sandy loam.

The Christian fine sandy loam is a valley soil occurring at somewhat higher elevations than the limestone soils and often marking a gradation zone between the sandstone soils of the higher lands and the limestone valley soils. It occurs in small, irregular patches bordering the lower mountain slopes, as in Jackson, Lemmon, and Winton, Coves, as well as along the upper slopes of the Cotaco Valley. It is also found in small gently rolling areas bordering the southern slopes of Little Mountain and the northern boundary of the Moulton Valley.

The type is naturally well drained and productive, and much of it is cultivated. A mixture of hardwoods and softwoods, both mountain and valley species, makes up the forest. The growth consists mainly of shortleaf yellow pine, chestnut oak, white oak, black oak, red oak, cedar, dogwood, ironwood, ash, and chestnut. Cotton is the leading crop, followed by corn. Oats, wheat, grasses, vegetables, and fruit occupy very much smaller acreages. Cotton yields from one-third to 1 bale per acre and corn from 20 to 35 bushels. The cultural methods and the fertilizer practice are similar to those employed on the Hagerstown fine sandy loam.

In the eastern end of the county, where this soil is nearly always sold with a large percentage of Rough stony land and Rough broken

land, its selling value is hard to determine, but varies from \$15 to \$30 an acre.

Terracing is of great importance on the steeper slopes of the Christian fine sandy loam, as the heavy winter and spring rains cause damaging erosion where no steps are taken to prevent it. Cover crops should be grown more extensively to control erosion, as well as to add organic matter. Some of the steeper areas should be kept in permanent pasture grasses.

CHRISTIAN CLAY LOAM.

The surface soil of the Christian clay loam consists of a reddish-brown to dull-red clay loam, 6 to 8 inches deep. The subsoil is a brick-red or reddish-brown, compact though friable clay. In places the type, as mapped, is a brown to reddish-brown loam to very fine sandy loam having a red silty clay to moderately friable red clay subsoil. In many places the lower subsoil contains faint mottlings of gray and numerous dark-gray to black iron-oxide concretions. A thin surface layer of fine sandy loam occurs in places, but in plowing this is mixed with the underlying heavier soil and produces a soil of mellow clay loam texture. A few small fragments of chert, sandstone, and occasionally of limestone are scattered over the surface and mixed with the soil.

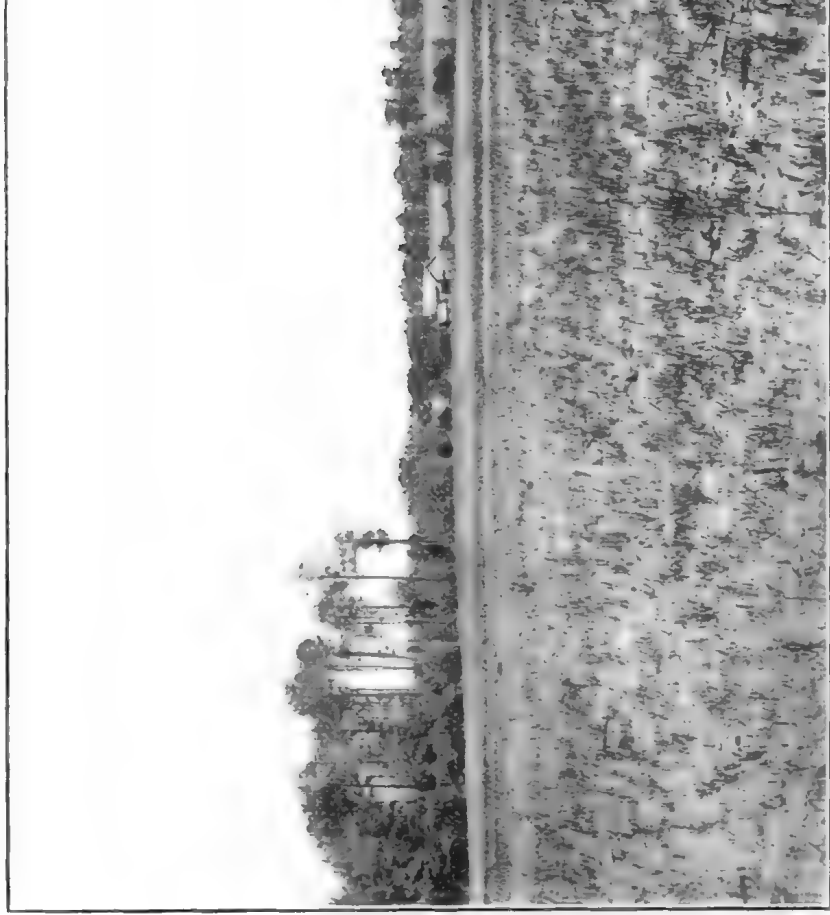
The Christian clay loam is confined to a few scattered areas occurring principally in the Moulton and Cotaco Valleys near the union of the sandstone and limestone formations. The largest areas lie in the vicinity of Gandys Cove, west of Neel, west of Massey, and 1½ miles southwest of Penn School. The surface is gently rolling to undulating, and the natural drainage is good.

Practically all of this type has been cleared and placed under cultivation. It is considered a strong soil, and fair yields of cotton and corn are obtained. The yields are slightly larger than on the fine sandy loam, but this gain is offset in some degree by the greater difficulty of cultivating the heavier soil. The clay loam responds readily to deeper plowing, the application of lime, and the addition of commercial fertilizers. The type is handled in practically the same manner as the Decatur soils.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Christian clay loam:

Mechanical analyses of Christian clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415943.....	Soil.....	0.6	0.6	0.6	19.4	10.2	45.9	22.6
415944.....	Subsoil.....	.4	.4	.4	16.8	8.6	38.9	34.3



NEARLY LEVEL TOPOGRAPHY OF THE DEKALB SILT LOAM AT AN ELEVATION OF ABOUT 100 FEET ABOVE SEA LEVEL.
This area lies near Ryans School on top of Brinley Mountain.



CHARACTERISTIC TOPOGRAPHY OF THE NARROW COTACO VALLEY AND CONTRASTING MOUNTAIN SLOPES.

Pope silty clay loam and Hagerstown fine sandy loam in foreground.

DEKALB FINE SANDY LOAM.

The surface soil of the Dekalb fine sandy loam consists of a gray, grayish-yellow, or light-brown fine sandy loam, having a depth of 8 to 12 inches. The subsoil is a pale-yellow, friable fine sandy clay which often becomes stiffer in the lower part. In places the soil contains some fine pieces of angular sandstones and shales. The sandstone bedrock is usually several feet below the surface, though it may lie within the 3-foot section. In some places on Whitesburg Mountain and elsewhere the substratum or lower subsoil is red, like that of the Hanceville soils. Included with the type are patches of Lickdale silt loam, Hanceville fine sandy loam, and Dekalb silt loam.

The Dekalb fine sandy loam is mapped in a few places near the northern escarpment of Little Mountain. The largest and most important areas occur on the higher mountains, usually near the peaks. Some of them lie near Ryan School, Dripping Spring School, Lawrence Cove, Rescue, West Point School, south of Union Hill School, and near Union Grove Church. The surface varies from gently undulating to gently rolling and is often marked by gullies several feet deep. Drainage is naturally well established.

About three-fourths of the type is cleared and cultivated. Short-leaf yellow pine makes up nearly 50 per cent of the forest, with white oak, chestnut oak, black oak, red oak, hickory, and ash forming most of the remainder. Chestnut at one time was of considerable importance, but it has almost entirely disappeared as the result of attack by the blight.

This type is devoted to the same crops as the silt loam. Cotton and corn as a rule give lower yields than on the latter, but fruit and vegetables do even better than on the silt loam. The land is plowed and worked into a seed bed in the same way as the silt loam, but more attention is paid to terracing, owing to the rolling topography and the looser structure of the subsoil.

Land values on the Dekalb fine sandy loam range from \$10 to \$30 an acre, depending upon the location, improvements, and topography. The more nearly level and less dissected areas bring the higher price.

More efficient terracing is needed on this soil, and greater attention should be given to the incorporation of organic matter and lime. A systematic crop rotation would give good results. The type is naturally an excellent vegetable and peach soil. Peanuts also give good returns and are a valuable crop in that they enrich the soil.

Dekalb fine sandy loam, gravelly phase.—The surface soil and subsoil of the Dekalb fine sandy loam, gravelly phase, are similar to those of the typical Dekalb fine sandy loam in all respects except in gravel content. The phase contains a much larger percentage of coarse rock fragments. These are angular and consist of sand-

stone and argillaceous shale. A few of the stones are 1 foot or more in diameter, but most of them are not much larger than a hen's egg.

This phase is of small extent. The largest areas occur in the southeast corner of the county, south of Pleasant Ridge Church, southwest of Blue Springs Church, and in a few other places. The surface is hilly to rolling, the areas marking the beginning of the break from the more nearly level areas of Dekalb silt loam or fine sandy loam occupying the mountain tops and the rougher types of the mountain slopes. Both surface drainage and underdrainage are good or even excessive.

Little, if any, of the phase is cleared, most of it supporting the same kind of forest as the typical soil. Its principal value lies in this forest cover, but it is used to a small extent for pasture. Its selling value is considerably lower than that of the better situated and less stony and gravelly mountain soils.

A considerable percentage of the Dekalb fine sandy loam, gravelly phase, could be cleared and used for the growing of peaches, apples, plums, and pears, as well as corn, cotton, and other field crops. Only the flatter areas should be cleared, however, as erosion would make the steep areas unfit for cultivation in a very few years.

DEKALB SILT LOAM.

The Dekalb silt loam typically consists of a light-gray or grayish-yellow silt loam, passing at 3 to 6 inches into a heavy, pale-yellow silt loam which grades at about 12 inches into a yellow, friable clay loam or clay. The substratum often contains faint-gray mottlings, due in most cases to partly decomposed shale or sandstone fragments, harder pieces of which are encountered on the surface and through the 3-foot section. The surface 3 or 4 inches contains a relatively large proportion of fine to very fine sand, which is present in sufficient quantities in some places to mix, when plowed, with the heavier underlying layer and give a loam texture to the surface soil. Some of the largest of these loam areas lie near the Cullman and Marshall County lines. In the flatter places a few small depressions occupied by Lickdale silt loam are included with the type as mapped. Patches of Dekalb and Hanceville fine sandy loam are also included.

The Dekalb silt loam is the most extensive soil in Morgan County. It is found on gently undulating to nearly level, broad, plateau-like areas on Little Mountain and Whitesburg Mountain, and in similar positions elsewhere in the county. (Pl. I.)

The type is well drained and the greater part of it has been cleared and placed under cultivation, though there are still many uncleared areas. The type is being developed very rapidly, and within a few years all the better areas will probably be cleared. The native forest

consists of shortleaf yellow pine, white oak, black oak, chestnut oak, poplar, gum, ash, and hickory.

Cotton is the principal crop. Corn, oats, wheat, hay, vegetables, and fruit are produced on most farms in a small way, but seldom in sufficient quantities to sell. Cowpeas, velvet beans, and soy beans are often grown between the rows of corn and cowpeas and soy beans between the rows of cotton. Peanuts are fast becoming an important crop. Peaches, apples, plums, pears, and strawberries thrive, as do the common vegetable crops. Part of the type is used for pasture, Bermuda grass and lespedeza making the principal growth. Some dairy cows, hogs, and poultry are kept on nearly every farm.

Cotton averages about one-third bale per acre, but ranges from one-fourth to 1 bale. The yield of corn ranges from 15 to 35 bushels.

The farms on this soil are usually small and worked by the owners. The land is plowed in the late winter or early spring, usually with a 1-horse plow. After breaking, the seed bed for cotton is thrown into ridges, and the seed is planted on the ridge in the latter part of April or early in May. A few farmers plant cotton in a level seed bed. Corn is planted in the water furrow. A few farmers practice a rotation consisting of cotton 1 year, corn 1 year, and wheat or oats, followed the same year by cowpeas. Aside from pruning, little or no attention is given to the fruit trees, many of which are badly affected with scale and diseases.

Almost all the fertilizer used is applied to the cotton crop, being applied in the row at planting time in quantities ranging from 200 to 400 pounds per acre. A 10-2-2 fertilizer is most popular, but of late years a home mixture of cottonseed meal and phosphoric acid has been used by many farmers.

The selling value of the Dekalb silt loam varies from \$15 to \$40 or even more an acre, depending upon the improvements, state of productiveness, and nearness to transportation lines and good roads. Farms on or near improved roads often sell for \$10 an acre more than those only a mile or two from the pikes.

The Dekalb silt loam as a whole is lacking in organic matter and lime, but it responds very readily to good methods, and with deep tillage and proper treatment will give profitable returns of such crops as cotton, peanuts, cowpeas, soy beans, vegetables of all sorts, and fruits.

HANCEVILLE GRAVELLY FINE SANDY LOAM.

The Hanceville gravelly fine sandy loam consists of a light-brown to reddish fine sandy loam, 6 to 10 inches deep, overlying a reddish-brown, friable sandy clay. Both soil and subsoil carry a large admixture of small angular fragments of sandstone and shale. The bedrock lies nearer the surface than in case of the fine sandy loam, and in places is encountered within the 3-foot section. A few out-

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Valentine loamy very fine sand:

Mechanical analyses of Valentine loamy very fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
372788.....	Soil.....	0.2	2.4	4.8	37.1	33.7	17.6	4.2
372789.....	Subsoil.....	.1	3.3	5.8	40.9	30.4	13.3	6.2

VALENTINE FINE SANDY LOAM.

The Valentine fine sandy loam, to an average depth of 10 inches, consists of a grayish-brown to brown, loose, friable fine sandy loam. Small gravel is often thinly scattered over the surface. The material gradually becomes lighter in color with depth, and at about 24 inches is a light grayish brown to almost gray, fine sandy loam. Both soil and subsoil are deficient in organic matter. The type differs from the Rosebud fine sandy loam chiefly in the noncalcareous nature of the subsoil.

The Valentine fine sandy loam occurs in a few scattered areas over the upland in the eastern and northwestern parts of the county. The areas are irregular in shape and vary in size from a few acres to 2 or 3 square miles. The exact origin of this soil has not been determined. It has probably been derived partly by weathering from the sandy strata of the Tertiary and partly by wind action. Its topography is flat to gently undulating. The type usually occupies shallow depressions, somewhat lower in elevation than the other soils of the series. Drainage is adequate. The porous subsoil absorbs most of the light rainfall.

Only a very small proportion of this soil is in cultivation. It is well adapted to crops, however, and fair yields are obtained in favorable seasons. The type is subject to wind erosion when plowed, but does not drift so badly as the Valentine loamy fine sand.

Most of this soil is included in stock farms on which cattle raising is the principal industry. The native vegetation consists of grama grass, buffalo grass, needle grass, and coarse sand grasses. From 10 to 15 acres are required to pasture a cow or steer throughout the year when hay is added to the ration during severe weather. On the cultivated parts of the type corn, wheat, and oats are the principal crops. Corn yields 10 to 20 bushels per acre, wheat 10 to 30 bushels, and oats 15 to 40 bushels. The land sells for \$8 to \$15 an acre, the price depending chiefly upon the improvements.

ments and breaks, ordinarily near the northern slopes, while farther back, in the more nearly level areas, the type forms the slopes of the many streams and occupies the higher ridges. The surface ranges from gently rolling to nearly level or gently sloping, and drainage is adequate. The run-off is rapid enough in places to cause erosion. Approximately 60 per cent of the type is cultivated. The remainder supports a stand of shortleaf pine, ash, and red oak, with an undergrowth of shrubs.

Cotton and corn are the principal crops. The minor crops consist of oats, wheat, cowpeas, peanuts, velvet beans, vegetables, and fruits, including peaches, apples, pears, and plums. Hogs, chickens, and cows are kept in sufficient numbers to supply the home with meat, eggs, butter, and milk. The yields vary considerably from place to place. Cotton yields from one-third to 1 bale or more per acre, and corn 15 to 35 bushels. Vegetables, peanuts, cowpeas, and fruit give good returns.

This soil dries out quickly after rains and is very easily tilled, and light 1-horse implements are commonly used in plowing and cultivating. It is not uncommon to plant cotton or corn a week or 10 days earlier than on the heavier soils. Terracing is necessary in most places to prevent erosion, and considerable attention is given by the farmers to this important matter. Velvet beans and cowpeas are usually seeded between the rows of corn and cowpeas in cotton, as a means of enriching the soil by adding organic matter.

Under normal conditions a 10-2-2 fertilizer is used on cotton and to a less extent on corn, at the rate of 200 to 400 pounds per acre. It is applied in the row at the time of planting. A mixture of acid phosphate and cottonseed meal or acid phosphate alone is used for these crops on some of the farms.

The mountain farmers seem to prefer the "red land" (Hanceville) to the "yellow land" (Dekalb), and where the topography is the same the Hanceville fine sandy loam sells for a few dollars more an acre than the adjacent Dekalb soils.

The Hanceville fine sandy loam is an excellent fruit, peanut, and vegetable soil. By adopting some regular crop rotation, deeper plowing, terracing, and turning under large amounts of organic matter, it would be possible greatly to increase the productiveness of the type.

LICKDALE SILT LOAM.

The Lickdale silt loam, to a depth of 6 or 8 inches, is a gray silt loam, with a layer of dark-brown leaf mold about 1 inch thick on the surface. The subsoil is a heavy, plastic silty clay to clay, mottled gray and yellow. The areas northwest of Rock Creek Church depart from typical in having a dark-brown to grayish-brown silt loam sur-

face soil and a pale-yellow or mottled yellow and gray clay loam to clay subsoil, with the underlying rock very near the surface.

This is a mountain soil of small extent. The most important areas are those northwest of Rock Creek Church, southwest of Somerville, and in the vicinity of Hartsells, occupying small swamplike depressions at the heads of streams. The type is very poorly drained, and during the winter and in wet seasons water stands on it for weeks at a time. The areas near Rock Creek Church, which lie on colluvial slopes near the base of hills, are wet and seepy.

The Lickdale silt loam is nearly all covered with a growth of sweet gum, black gum, willow oak, water oak, poplar, maple, pine, and sycamore, with various water-loving shrubs and grasses. The forested areas are used for pasture during dry seasons. Part of the type could be drained, and this with the addition of lime and other amendments should produce crops of corn and cotton, though the heavy, plastic clay subsoil would have an unfavorable influence on the yields.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Lickdale silt loam:

Mechanical analyses of Lickdale silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415941.....	Soil.....	0.0	0.4	0.6	15.4	15.6	58.2	9.7
415942.....	Subsoil.....	.4	.8	1.1	12.4	14.4	50.2	20.4

ELK FINE SANDY LOAM.

The Elk fine sandy loam consists of 10 to 13 inches of grayish-brown to brown fine sandy loam, overlying a brownish-yellow or yellow, friable silty clay to clay, compact and mottled with gray and yellow or brown in the lower part of the profile.

Included with this type, as mapped in the region of Cotaco Landing and Leman Ferry and in a few other places, are some long, low ridges, the soil of which differs from the typical in having a reddish color to a depth of 3 feet or more. These ridges in many places are surrounded by first-bottom soils.

This type is associated with the Elk loam and with the overflow soils of the Tennessee River. Important areas occur in the vicinity of Laceys Spring, Whitesburg Ferry, Wallins Store, and in a few other places. The surface is gently undulating to flat, but drainage is well established in the surface, although imperfect in the lower subsoil. Occasionally the river water floods this type, but only during exceptionally high stages.

Practically all of the Elk fine sandy loam is cleared and devoted to the production of corn, cotton, oats, hay, wheat, and sorghum.

Yields are about the same as on the Elk loam, and the soil is handled in about the same manner. It is somewhat deficient in organic matter, and crops are more inclined to suffer during dry periods.

ELK LOAM.

The Elk loam to a depth of 6 to 10 inches consists of a grayish-brown or brown loam overlying a yellow clay loam or silty clay which becomes more plastic with depth and at about 24 inches grades into a friable, heavy, yellow clay, slightly mottled with faint gray and rusty brown. Iron-oxide concretions are often present in the lower subsoil.⁴ Some small quartz pebbles and gravel commonly occur on the surface.

The Elk loam is largely confined to the northeastern corner of the county, in the bends of the river near Triana Ferry and Whitesburg Ferry. It lies 25 feet or more above the normal river level, and is slightly undulating to nearly level, with a gradual slope toward the stream. It is a second-bottom soil, and subject to inundations only at times of exceptionally high floods. The lower subsoil is imperfectly to poorly drained.

All of the Elk loam except a few of the wetter areas is cleared and cultivated. Here the forest growth is similar to that on the Huntington silty clay loam.

Corn, cotton, hay, sorghum, oats, and wheat are grown on this soil. Corn, which is the main crop, yields between 25 and 30 bushels per acre. Cotton is not grown to any great extent, as the soil is often so wet in the spring that it can not be plowed until late, and the crop if planted late may be damaged by early fall frosts. The yield in normal seasons ranges from one-third to two-thirds bale per acre. Oats yield from 20 to 30 bushels per acre, cowpeas for hay 1 to 1½ tons, and sorghum for sirup 100 to 125 gallons.

The Elk loam is an easy soil to handle when the moisture condition is right, and it is usually tilled with 1-horse implements. Little or no fertilizer is used.

The selling value of this land ranges from \$20 to \$35 an acre, depending upon the drainage, location, and improvements.

The Elk loam would be greatly improved by underground drainage and by the adoption of some regular rotation.

HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam consists of 12 to 15 inches of light-brown loamy fine sand to fine sandy loam, underlain by a dark-brown or yellow fine sandy loam or yellowish-brown fine sandy

⁴Many small areas lying at a slightly higher elevation, and therefore better drained, in which the soil is reddish brown and the subsoil a reddish, friable clay, are included with Elk loam. These, if of sufficient size, would be shown as the Cumberland loam. Small areas of Elk fine sandy loam and silt loam also are included with the type as mapped.

clay. There is a relatively large proportion of finely divided mica throughout the 3-foot section. A considerable part of the type has a loamy fine sand subsoil. The soil is usually sandier on the ridges forming the banks or natural levees of the Tennessee River than farther away from the stream.

The Huntington fine sandy loam is an inextensive type occurring in narrow belts along the banks of the Tennessee River and in a few of the smaller stream bottoms. It is a first-bottom alluvial soil, but owing to its position on the higher river banks only the lower or inland slopes are subject to the seasonal floods, the higher parts being flooded only at exceptionally high stages of the river. The areas along the small streams are covered with water many times a year.

The steeper river slopes support a forest of poplar, maple, sycamore, water oak, cottonwood, butternut, hickory, and gum, with an undergrowth of cane. Nearly all the type except the steep slopes near the river is cleared and cultivated. Corn is the main crop. Oats, Johnson grass, and sorghum are produced to some extent. In general the type occurs in such small patches or narrow strips that it is farmed in conjunction with larger areas of Huntington silty clay loam, and it is handled in the same manner as the latter type.

HUNTINGTON SILTY CLAY LOAM.

The Huntington silty clay loam, to a depth of 12 or 15 inches, consists of a brown to dark-brown silty clay loam, which when dry is grayish brown in color. The subsoil is a yellow to yellowish-brown silty clay or silty clay loam, slightly mottled with gray in the lower part. In many of the lower lying areas occupying depressions the subsoil is mottled-gray and dark-brown clay. In places the surface soil varies in texture from loam to clay, but the prevailing texture is silty clay loam.

West of Decatur and in other places where the Decatur soils predominate the alluvial deposit along the small streams consists of a red silty clay surface soil with a mottled yellow and gray or brown clay loam to clay subsoil. This material is in reality the Abernathy silty clay loam, but owing to its small extent it is not shown separately on the map.

The Huntington silty clay loam occurs principally in the first bottoms of the Tennessee River and in parts of the Flint Creek and Cotaco Creek bottoms. The material is largely of limestone origin, and has been transported and deposited by the streams along which it lies. It is subject to floods, which usually occur during the winter and spring months, though sometimes heavy rain during the growing seasons results in overflows that kill or damage crops.

Drainage is fairly good, though open ditches ordinarily are necessary to aid in carrying off the flood water. The lower subsoil, especially in the depressions, is poorly or at least imperfectly drained.

Considerable areas of the Huntington silty clay loam have been cleared and put in cultivation. The uncleared areas support a growth of shagbark hickory, bitternut hickory, sweet gum, black gum, poplar, cottonwood, ironwood, beech, white oak, chestnut oak, water oak, elm, hackberry, silver maple, red maple, sycamore, and red haw. There are occasional small cane brakes on the higher knobs or ridges.

Corn is the principal crop on this soil. A few small fields are devoted to sorghum, Bermuda grass, Johnson grass, red clover, cotton, and oats. The ordinary yield of corn is between 25 and 35 bushels per acre, though much larger yields are often obtained.

The bottoms are usually plowed with 2-horse turning plows, and harrowed. Corn is planted either on a level seed bed or on slight ridges. A few farmers throw eight furrows together, then plow eight the other way, so as to leave a ditch, and plant on the beds thus made. Corn is usually planted sometime after the upland crop. Little or no fertilizer of any kind is used on this soil. The type is highly prized, and brings from \$20 to \$50 an acre.

HOLLY SILT LOAM.

The Holly silt loam, to a depth of 8 to 10 inches, consists of a gray to almost white silt loam. This grades through a gray or slightly mottled gray and yellow silty clay loam into a stiff, plastic, drab, or bluish-gray clay which contains some yellow markings.

This type is developed in the wettest portions of the river and stream bottoms, in such places as old sloughs. It owes its origin to the deposition of materials washed from the limestone valley soils. It is very poorly drained, and subject to frequent overflow.

The type is practically all uncleared. It supports a growth consisting principally of tupelo gum, black gum, sweet gum, water oak, elm, hackberry, and hickory. The type is valued chiefly for the timber, and it occurs in such small areas that it is usually sold with the Huntington silty clay loam.

POPE FINE SANDY LOAM.

The surface soil of the Pope fine sandy loam is a grayish-brown, yellowish-brown, or light-brown fine sandy loam, 8 to 12 inches deep. The surface, 2 or 3 inches, often consists of a loamy fine sand. The subsoil is a brownish-yellow loam or silty clay loam, which sometimes becomes heavier in the lower subsoil, and is often mottled with gray and yellow. In places the subsoil grades into a drab or steel-blue

clay mottled with dark brown or yellow. Near the banks of the larger creeks the subsoil is a light-brown or yellow fine sand.

The Pope fine sandy loam is not an extensive type. It is found in the higher parts of the larger creek bottoms, usually on the stream banks and in some of the smaller bottoms. The material has been washed from the sandstone soils of the mountains. The soil is fairly well drained, and is used for the same crops as the Huntington fine sandy loam.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Pope fine sandy loam:

Mechanical analyses of Pope fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415903.....	Soil.....	0.0	0.2	0.4	42.8	23.0	25.8	7.4
415904.....	Subsoil.....	.0	.4	.6	19.0	20.1	42.6	16.9

POPE SILTY CLAY LOAM.

To a depth of 8 to 12 inches the Pope silty clay loam is a light to dark brown silty clay loam. The subsoil typically is a brownish-yellow or yellow silty clay loam to silty clay, with some faint dark-brown and gray mottlings below 24 inches. There are many variations in the type as mapped. In some places the surface soil is a loam, and in others more nearly a clay. There are some depressions, as near Flint Bridge, where the drainage is more imperfect, in which the surface soil is a gray or nearly white silt loam underlain by a heavy, compact, drab or mottled yellow and gray clay. The soil in such areas is in reality the Atkins silt loam, but owing to its very small acreage, it is not separated on the map.

The largest and most continuous areas of Pope silty clay loam lie in the overflowed bottoms of Cotaco (Pl. II) and Flint Creeks and many of their larger tributaries, such as Town Creek, Sixmile Creek, No-Business Creek, Scrouge About Creek, and Neel Branch. As a whole the type is fairly well drained, except during overflow periods, when water often remains on the surface for many days at a time. Floods for the most part occur during the winter and early spring, but occasionally crops are "drowned out" during the summer.

A considerable part of the type is cleared and cultivated. The forested areas are covered with water oak, ironwood, birch, bay, poplar, red maple, hackberry, and sweet and black gum, with willow and sycamore along the stream bank. Some cane brakes are still found, but most of them have been cut.

Corn is the principal crop. Small fields are devoted to Johnson grass, crab grass, and Bermuda grass, as well as to oats, sorghum, red

clover, and cotton. The yield of corn ranges from 20 to 50 bushels or more per acre, with an average of approximately 25 bushels. Sorghum for sirup yields 100 to 150 gallons, and Johnson-grass hay between 2½ and 4 tons per acre.

This soil is handled in about the same manner as the Huntington silty clay loam, but it is not valued quite as high as the river-bottom soils, on account of the greater danger of flooding during the growing season. The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Pope silty clay loam:

Mechanical analyses of Pope silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
415905.....	Soil.....	0.0	0.3	0.3	2.0	9.0	67.8	20.8
415906.....	Subsoil.....	.1	.6	.6	13.2	17.0	45.2	23.1

ROUGH STONY LAND.

Rough stony land comprises areas where an abundance of stone, together with a rough, steep topography makes agriculture impossible. The stone fragments vary from small to very large. Most of the rocks occur as broken ledges, and comprise limestone, sandstone, and shale. The largest areas of Rough stony land are mapped on the steep, precipitous slopes of Little, Whitesburg, and other mountains. The limestone in most places seems to extend many feet up the slope, being capped by the sandstone or shale. In places a sandstone conglomerate occurs, and often alternate layers of limestone and sandstone outcrop. The interstitial soil may resemble almost any of the limestone or sandstone soils of the county. On the lower slopes Hanceville and Dekalb material from the upper slopes has been washed down and mixed with Colbert and other limestone-soil material. In the limestone valleys there occur small areas known as "glades," which consist of wide flat exposures of the limestone bedrock. Here the little soil material present resembles the Colbert in every respect.

The Rough stony land is covered with a forest growth, the character of which seems to bear a close relationship to the rock giving rise to the soil material. The growth in the "glades" is made up for the most part of a dense stand of small cedar. The limestone sections of the mountain slopes support a growth of cedar, white oak, red oak, chestnut oak, Spanish oak, black oak, and hickory. The areas comprised of sandstone are covered with shortleaf pine, with an admixture of oak, chestnut, and hickory. In addition, dogwood, persimmon, wild haw, blackberry, and wild plum grow on both classes of

material. Near the many springs and seepage spots the common bottom-land type of tree growth is seen.

This land is held in large tracts and its value is based upon the stand of timber. Some of the areas could be used for pasturing sheep and goats.

ROUGH BROKEN LAND.

The term Rough broken land is applied to rough, steep mountain slopes and breaks. The areas are free from large quantities of stone, though some sandstone ledges or fragments occur in places, as indicated on the map by outcrop, stone, or gravel symbols. The soil consists of Dekalb or Hanceville material, mainly the latter. The surface layer of a few inches is in most cases of fine sandy loam, loam, or clay texture.

The Rough broken land is usually situated above the zone of limestone outcrop on the steep upper slopes of the mountains, or in places where the underlying limestone soils have been nearly covered by deep deposits of colluvial material from the upper slopes. Owing to the steep topography the type has little or no agricultural value. It is covered with a first or second growth of shortleaf pine, oak, and hickory, and its chief value is in the timber. Sheep and goats could be pastured cheaply on this land. The type is held in large tracts by the owners of the more desirable adjacent soils.

SUMMARY.

Morgan County is situated in the northern part of Alabama, the Tennessee River forming the northern boundary. The county comprises lowland-belt (Limestone Valley), mountain, or upland-belt, and stream bottom divisions, the topography ranging from flat to gently rolling in the valley sections, from gently undulating to rolling on the plateau tops, and from moderately steep to steep and broken on the mountain slopes. The elevation ranges from somewhat more than 500 feet above tide along the Tennessee River near Decatur to 1,200 feet above on the highest crests of the mountains.

Morgan County lies in the Tennessee drainage basin. In the mountains the stream channels are deep and the currents swift, but in the valleys the flow is gentle.

The population of Morgan County in 1920 was 40,196, of which two-thirds was classed as rural. The inhabitants are largely descendants of the early settlers, though in the Moulton and Tennessee Valleys and in a few other places there is a large colored population.

Corn and cotton are the principal agricultural products of the county. Cotton is by far the most important cash crop, though there is a surplus of corn for sale. The minor crops include peanuts, oats, Johnson grass, red clover, redtop, velvet beans, cowpeas, wheat,

vegetables, peaches, and apples. Hogs, cattle, horses, and mules are raised in the county, but not in sufficient numbers to supply the local demand.

Cotton is grown on all the upland soils, but rarely in the bottoms. Much of the corn is grown on the bottom soils. Nearly all the red clover is produced on the limestone soils. The mountain soils (Hanceville and Dekalb) are recognized as best suited to peanut, vegetable, and fruit production.

Morgan County lies in the Limestone Valleys and Appalachian Mountain soil provinces. Nearly all the upland soils are residual from the underlying sandstone, shale, and limestone. The Hanceville, Dekalb, and Lickdale soils are derived from sandstone and shale. The limestone soils are classed in the Decatur, Hagerstown, and Colbert series. The Pope, Huntington, and Holly are first-bottom soils, occurring along the streams. The Pope consists of alluvial material washed from sandstone areas, while the Huntington and Holly have a similar limestone origin, but differ in drainage, the Holly being very poorly drained.

The Hanceville fine sandy loam in general is a well-drained soil, and agriculturally important. It is considered a good cotton and corn soil, and is also very well adapted to fruit, peanut, and vegetable production. The gravelly fine sandy loam, because of its more rolling topography and gravel content, is not prized so highly, although it is a good soil. Both soils require terracing and careful management.

The Dekalb soils differ from the red Hanceville types in having yellow subsoils. The silt loam is the most extensive and most important soil in this series. Cotton and corn give fair returns on this type. Peanuts, soy beans, velvet beans, vegetables, and fruits of various kinds seem especially well suited to the Dekalb soils.

The Decatur soils are the reddest and most rolling of the limestone province. They are strong, productive soils, devoted to the production of cotton and to a less extent to corn, red clover, and velvet beans. The fine sandy loam, silt loam, and clay loam types of this series are mapped in Morgan County. The clay loam is by far the most extensive.

The Hagerstown soils, like the Decatur, are of limestone origin, and are similarly well drained and productive. They differ in having a brown surface soil and a light-red or brown subsoil. The Hagerstown gravelly loam, fine sandy loam, and loam types are mapped. The fine sandy loam is the only important member in Morgan County.

The Colbert soils differ from the other limestone types in having a light-colored surface soil and a heavy, plastic, yellow or mottled yellow and gray clay subsoil. The best drained and most highly esteemed of the Colbert soils is the fine sandy loam, a large part of

which is drained and farmed. The Colbert fine sandy loam, slope phase, occurs along the lower mountain slopes and consists of sandstone material in the surface and limestone material in the subsoil. The Colbert silt loam occurs in depressed areas in the valleys, and is often covered with water. It is little used for farming. The Colbert clay is a heavy, plastic, sticky soil, of small extent and of little agricultural value.

The Hollywood clay is a heavy, black clay, with a slate-colored or mottled, heavy, plastic clay subsoil. It is partly cleared and used mainly for growing corn. It is difficult to handle, and must be plowed when the moisture content is best. The type needs draining and liming.

The Christian fine sandy loam and clay loam are strong, productive valley soils, of small extent.

The Elk fine sandy loam and loam are second-bottom soils developed near the Tennessee River, in the northeastern corner of the county. They are subject to overflow only during exceptionally high floods. Corn is the principal crop grown.

The Huntington fine sandy loam is an inextensive soil. It is cleared and used for corn production. The Huntington silty clay loam is a fairly well-drained first-bottom soil developed along the Tennessee River and in the lower courses of the large creeks. It is an important corn soil.

The Holly silt loam is an inextensive soil mapped in the sloughs and other poorly drained areas of the first bottoms. It consists of reworked limestone material. The type is of little importance agriculturally.

The Pope soils are first-bottom types which correspond to the Huntington except in origin. The fine sandy loam is of small extent, while the silty clay loam is much more extensive. Corn is the leading crop on the Pope soils.

Rough stony land and Rough broken land embrace areas too stony or too broken and rough for agriculture.



[PUBLIC RESOLUTION—No. 9.]

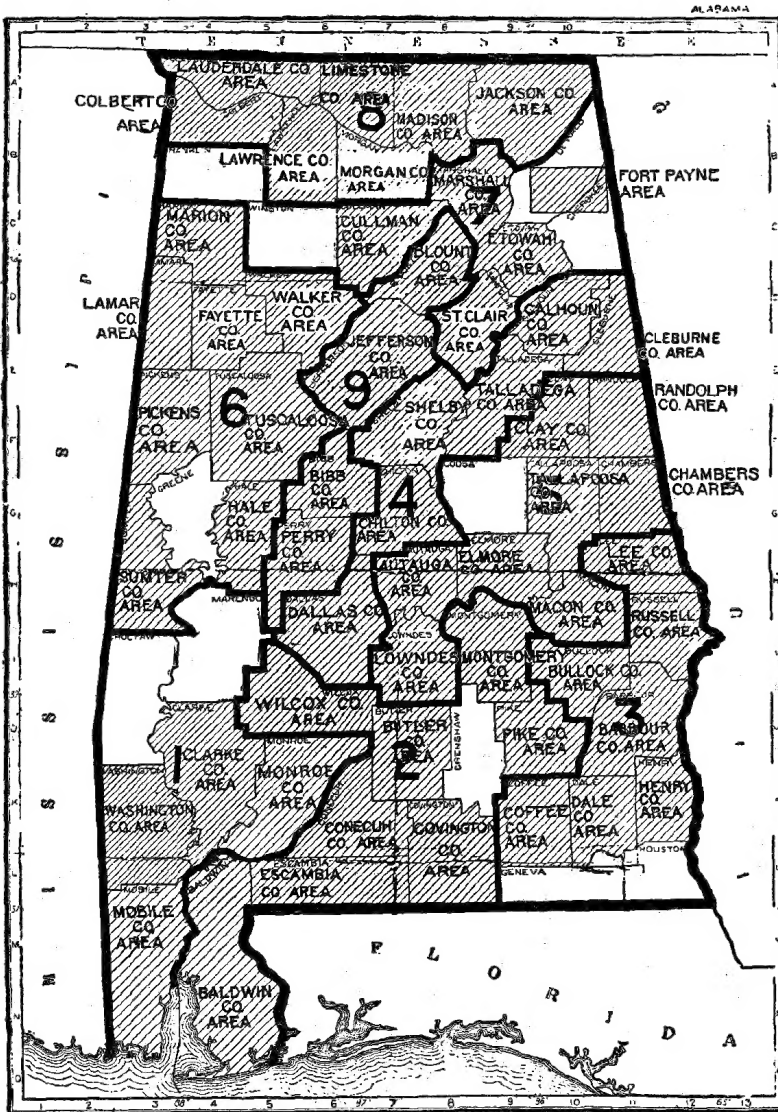
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Alabama.

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